school of astronomy has lost an exponent whom it is not easy to replace. But it would be an injustice to his memory to forget that he showed at times considerable power of originality. His work on such questions as that of the Solar Parallax is deservedly well appreciated. Thirty years ago the problem of the sun's distance occupied a very different position to what, it does now. Encke's value, obtained from the discussion of the Transits of Venus of 1761 and 1769, long used without question or hesitation, was beginning to lose its authority before the tests of more rigorous analysis, and the adoption of methods better suited for the determination of this fundamental constant. Stone, by his investigation of the observation of Mars in the opposition of 1862, contributed in no small measure to increase the suspicion which was hovering around the old value of 8″·58. With his attention drawn to this subject, he next reviewed the evidence on which this value was based. With better knowledge of the longitudes of the observing stations, and with possibly a more judicious interpretation of the observer's remarks, he was able to give not only greater accordance to the various observations, but to obtain a result more nearly equal to that derived from other sources of information. For this work he was awarded the gold medal of the Royal Astronomical Society, the President contending that Mr. Stone had shown, beyond all doubt, "that the method pursued by his illustrious countryman Halley, when fairly treated, is capable of furnishing a value of the Solar Parallax commensurate in precision with the expectations formed of it." The history of subsequent transits has, perhaps, not borne out this favourable view, expressed in 1869; but Stone's loyal and persistent efforts to deduce from the transits all that they were capable of giving are shown, by the part he took, both in 1874 and 1882. In the former year he was Her Majesty's astronomer at the Cape of Good Hope, and contributed much to the organisation of the various expeditions to the Southern Hemisphere. By the time of the second transit in 1882, he had succeeded to the direction of the Radcliffe Observatory on the death of the Rev. Robert Main, and there he trained the selected observers in methods suggested by the experience gained in 1874. After the transit, the whole of the observations were reduced under his immediate superintendence, with results too well known to need further mention.

It is needless to say that Mr. Stone's direction of the Radcliffe Observatory during the last twenty years was characterised with vigour and general success. Two important star catalogues were issued under his superintendence. The meteorological department received considerable attention, and Mr. Stone, in addition, accepted a seat at the Board of the Meteorological Council. In another matter, which one naturally wishes to pass over very briefly, his researches were not so successful, but have shown him the victim of a strange paradox. The comparatively large discrepancies which exist between the observed longitudes of the moon and those computed from Hansen's tables, he sought to explain by attributing their origin to the substitution of Le Verrier's tables of the sun for those of Carlini. This slight breach of continuity in the record of mean solar time, produced by the introduction of the newer tables into the Nautical Almanac was, he urged, the cause of the gradual increase in the error of Hansen's tables; and though many eminent authorities, including Profs. Adams and Newcomb, endeavoured to convince him of his error, he supported his views to the last, and regularly published the errors of the lunar tables, as derived from the Radcliffe observations, after applying to the mean time of observation a correction based upon his theory.

On two occasions Mr. Stone observed a total eclipse of the sun; the first at Klipfontein in Namaqualand, and last summer he accompanied Sir George Baden Powell to Nova Zemlya, where he was again successful in watching the phenomenon. But to the physical side of astronomy he gave little attention; nor is the Radcliffe Observatory equipped in a manner to make such observations possible.

Mr. Stone received many acknowledgments of the value of his work. Besides being a Fellow of the Royal Society, he had been President of the Royal Astronomical, and held other offices in connection with the same Society. He received a Doctor's degree from the University of Padua, and besides the Astronomical Society's medal, to which allusion has been made, the French Academy bestowed upon him the Lalande medal, as a testimony to the value of his Southern Catalogue of 12,500 stars. He died on Sunday, May 9, at his Oxford residence, aged sixty-six.

W. E. P.

NOTES.

The first of the two annual conversaziones of the Royal Society was held yesterday evening, as we went to press.

The University of Toronto has decided to confer the degree of LL.D. upon Lord Lister, Lord Kelvin, Lord Rayleigh, and Sir John Evans.

The fifteen candidates selected on Thursday last by the Council of the Royal Society to be recommended for election into the Society are:—Dr. R. Bell, Sir W. H. Broadbent, Bart., Dr. C. Chree, Mr. H. J. Elwes, Dr. J. S. Haldane, Prof. W. A. Haswell, Prof. G. B. Howes, Dr. F. S. Kipping, Prof. G. B. Mathews, Mr. G. R. Milne Murray, Mr. F. H. Neville, Dr. H. A. Nicholson, Prof. J. M. Thomson, Dr. F. T. Trouton, and Prof. H. H. Turner. Following our usual custom, we print in another part of this issue the certificates of the candidates selected.

Dr. C. Le Neve Foster has given men of science cause to be proud that he is one of them. On Saturday morning last he was at the Snaefell lead mine, Isle of Man, in his capacity of Her Majesty's Inspector of Mines. An explosion had occurred there on the preceding Monday, and Dr. Foster's object was to ascertain whether it was possible to recover the body of a miner remaining in the workings. Lighted candles sent down to test the atmosphere burnt brightly at 115 fathoms, but were extinguished at 130 fathoms. From these indications it was considered safe to go down a certain distance; so a party, consisting of Dr. Foster, Mr. G. J. Williams (Assistant Inspector of Mines), Captain Reddicliffe, Captain Kewley, and eight others descended the shaft. The air below was tested, and found to be poisonous; but as the party was only a few feet above the body of the miner, Captain Kewley went two or three steps down a ladder, and attempted to catch the man's clothing with grappling-irons. The commotion caused by his swinging to and fro appears to have disturbed the gas, for Captain Kewley was at once overcome, and had to be hauled back to the landing. He was put into the box, and the box was going up to the surface, when it became jammed, and for over an hour could not be moved. Meanwhile, Dr. Foster and those of his companions who could not climb to the surface were below suffering from the influence of the poisonous gas—apparently carbon monoxide. During this time, when death seemed to be very near, Dr. Foster made copious notes of his sensations. He commenced writing at 2 p.m., and continued until 3.30, when he was brought to the surface, he being the last to go up. Some of the men were unconscious when brought to the surface, and others arrived in an excited and hysterical condition. The record obtained by Dr. Foster will be a most valuable physiological document, for, judging from the extracts given in the daily press, the gas to which the exploring party was subjected has a peculiar effect upon the mind. As the minutes passed by, Dr. Foster's notes became more and more disjointed, and it is hard to believe that he knew exactly what he was writing towards the end. The following are a few of the notes written while he believed himself to be dying :—" I fear we are all dying. No help coming. . . . The box does not come. In spite of all our ringing for help, it will not come. Captain Reddicliffe is struggling. No real pain. Good-bye. I feel as if I were sleeping. Again, good-bye all ! 2.15 p.m.—We are all done. Oh, for the box ! It is held in the shaft. . . . It is really like a bad dream. No pain. No pain. For the benefit of others, no pain. . . . 2.25 p.m.—Two of the party are all right. I think they are ringing. When is help coming ? The box is gone. Four new men are coming. I don't feel bad. It is strange to write notes while we are dying. What a lot I have written ! Captain Reddicliffe is about the worst. I think he will go first. While there is life there is hope. Good old proverb ! Send a note for more brandy. Send for more help. The box has just gone up with Reddicliffe. Williams goes next —he has a capital heart. 2.45.—I have written pages. Kewley is a good fellow. There is life in the old horse yet. I feel as if I could sing. God is helping us ; he has heard our prayer. My turn to go." Arriving at the surface, and getting out of the box, Dr. Foster, note-book in hand, though weak and staggering, made the entry stating the time at which he got to the top. His last entry was :—" Dr. Miller says I must be quiet, but I won't." The pathetic side of this record, made by one who had almost crossed the dark valley, but was happily brought back to tell his tale, touches all of us. We admire Dr. Foster for his coolness in time of danger, and for remaining behind until all his party had been rescued. The world could ill spare a man with such sterling qualities, and science would grieve to lose an investigator who devoted what seemed to be his last moments to extending knowledge " for the benefit of others." We offer to Dr. Foster our heartiest congratulations upon his rescue, and we trust that he may never again have to repeat his terrible experience.

THE next annual meeting of the Australasian Association for the Advancement of Science will commence on January 6, 1898.

M. SOUILLART, Professor of Astronomy in the University of Lille, has been elected a Correspondant in the Section d'Astronomie of the Paris Academy of Sciences, in succession to the late Prof. Gyldén.

A REUTER correspondent at St. Petersburg states, on the authority of the *Novoe Vremya*, that an expedition is to be sent by the Russian Geographical Society and Academy of Sciences to study the geography and natural history of the Khanates of Roshan, Shignan, and Darwaz.

WE learn from *Science* that Miss Alice Bache Gould has given $20,000 to the National Academy of Sciences as a memorial to her father, the distinguished astronomer, Dr. B. A. Gould. It will be known as the Gould Fund, and the income will be used to promote researches in mathematics and astronomy.

A COMPLIMENTARY banquet will be given to Lord Lister at the Café Royal, Regent Street, on May 26, by his former house-surgeons, clerks, and dressers. A complete list is being prepared of those who have been closely associated with Lord Lister in his teaching career, which extends over a period of thirty-two years—from 1861 to 1893.

THE vehicles entered for the *Engineer* 1100 guineas road carriage competition will be examined by the judges on Friday and Saturday, May 28 and 29, at the Crystal Palace. The long-distance run, between the Crystal Palace and Post Office in Birmingham, will begin on Tuesday, June 1. The distance over the whole course, upon which the time allowance referred to in the conditions will be computed, has been fixed by the judges at 263 miles.

THE Prussian Academy of Sciences have made a grant of 1100 marks to Prof. Dr. Paschen, Hanover, for the study of the energy in the spectra of dark bodies ; and of 1000 marks to Dr. N. Herz, now at Heidelberg, for the reduction of observations made at the Kuffner Observatory, Vienna. Dr. O. Bütschli, Heidelberg, and Dr. A. Weismann, Freiburg, have been elected corresponding members of the Academy.

THE Engineering Conference, organised by the Institution of Civil Engineers, will be opened at 10.30 a.m. on Tuesday, May 25, in the large hall of the Westminster Town Hall, when the President, Mr. J. Wolfe Barry, C.B., F.R.S., will deliver a short address to the combined Sections. The several Sections will then proceed to the consideration of their respective business in the Town Hall and the Guildhall. The meetings will be continued on the 26th and 27th, at the same places, at 10.30 each day.

MR. ROBERT C. L. PERKINS, B.A. of Jesus College, Oxford, who has been for several years engaged on behalf of the Joint Committee appointed by the Royal Society and the British Association for investigating the zoology of the Sandwich Islands, has now returned to England, and, we rejoice to say, is in good health, notwithstanding all the hardships he has undergone. A very instructive paper by him, on " The Introduction of Beneficial Insects into the Hawaiian Islands," will be found in NATURE of March 25 last (p. 499).

THE summer meeting of the Anatomical Society of Great Britain and Ireland will be held this year in Dublin, on June 9, 10, and 11. A very large number of members have promised to attend, and the meeting will be remarkable on account of the numerous distinguished continental anatomists who are expected to take part in the proceedings. Amongst these are Prof. His, Leipzig ; Prof. Waldeyer, Berlin ; Prof. Stieda, Königsberg ; Prof. Spalteholtz, Leipzig ; Prof. Disse, Marburg ; Prof. Klaatsch, Heidelberg ; Dr. Otis, Boston ; Prof. Leboucq, Ghent ; Prof. van der Stricht, Ghent ; Prof. van Gehuchten, Louvain ; Prof. Retzius, Stockholm ; Dr. Kaestner, Leipzig ; Dr. de Bruyne, Ghent ; and Dr. Fröhse, Berlin. One of the features of the meeting will be an address to be delivered by Prof. His in the new theatre of the Royal Dublin Society, under the auspices of the Royal Academy of Medicine in Ireland. The subject which he has chosen for this address is the " Development of the Brain, Cord and their Nerves." The ordinary meetings of the Society will be held in the Anatomy School of Trinity College.

MR. LAWRENCE BRUNER, of the University of Nebraska, has (says the *American Naturalist*) sailed to Argentina to study the ravages of the locusts, which have recently developed into a terrible pest, certain regions being completely devastated by them. The Argentine Government has granted 400,000 dols. for relief, and a syndicate of business men have raised funds to employ Mr. Bruner to investigate the entomological aspects of the subject.

WE regret to have to include in this week's obituary the names of Prof. Legrand des Cloizeaux, member of the Paris Academy of Sciences, and distinguished for his works on crystallography and the optical properties of minerals ; Dr.

H. V. Carter, for many years professor of anatomy and physiology in the Grant Medical College at Bombay; Mr. Walter Rivington, author of a large number of papers on anatomical and surgical subjects, and Fellow of the University of London; Dr. Traill Green, formerly professor of chemistry at Lafayette College; Dr. E. Russow, formerly professor of botany at Dorpat; Dr. Ch. Scholz, professor of geodesy in the Polytechnikum at Delft; and Dr. Traill Green, one of the few surviving founders of the American Association for the Advancement of Science, first president of the American Academy of Medicine, and author of the "Floral and Zoological Distribution of the United States."

AT the Royal Institution, on Tuesday, May 25, Dr. Ernest H. Starling will begin a course of three lectures on "The Heart and its Work." The evening discourse on Friday, May 21, will be delivered by Lord Kelvin, his subject being "Contact Electricity of Metals." The Friday evening discourse next week (May 28), will be delivered by Prof. H. Moissan (Directeur, Laboratoire de Chimie Minérale à l'École Supérieure de Pharmacie, Membre de l'Académie des Sciences, Paris), who will lecture in French on "The Isolation of Fluorine" (with experiments). On Friday, June 4, Mr. W. H. Preece, C.B., F.R.S., will lecture on "Signalling through Space without Wires"; and on June 11, Mr. William Crookes, F.R.S., will deliver the last of the Friday evening discourses for the year: his subject will be "Diamonds."

THE Board of Agriculture have issued an order which prohibits the importation of dogs into Great Britain from any other country (except Ireland and the Isle of Man) otherwise than in accordance with certain provisions set forth. The order takes effect on September 15, 1897. After that date no dog may be landed in Great Britain from any other country without a licence from the Board of Agriculture, application for which is to be made to the Secretary of the Board. We agree with the *British Medical Journal* that this action of the President of the Board of Agriculture must be regarded as a step in the right direction. Any scheme for the extermination of rabies and its dependent hydrophobia which does not deal with importation of dogs must be incomplete. It is pointed out, however, that if simultaneous action as to the enforcement of muzzling and importation regulations be not taken in Ireland, it is to be feared that the present attempt to exterminate rabies from Great Britain may fail. A general muzzling order and the present importation order should now be made applicable to Great Britain and Ireland; for, without further assurance of freedom from rabies than can now be given, it cannot be regarded as absolutely safe to introduce without restriction dogs from one part of the United Kingdom to another.

THE provisions of the new Dingley Tariff Bill, taxing books, apparatus, and antiquities imported into the United States, raised such a storm of protests from scientific men and institutions of learning, that they appear to have been abandoned; for we learn from *Science* that the Tariff Bill, as amended by the Senate Finance Committee, includes the following additions, among others, to the list of objects which may be imported free of duty: books, maps, music, engravings, photographs, etchings and charts, printed more than twenty years before the date of importation; all hydrographic charts and scientific books devoted to original scientific research, and publications issued for their subscribers by scientific and literary associations, or publications of individuals for gratuitous private circulation, and public documents issued by foreign Governments; books, maps, &c., especially imported, not more than two copies in any one invoice, for the use of any society or institution established solely for religious, philosophical, educational, scientific or literary purposes, or for the encouragement of the fine arts, or for the use of any college, school or public library, and not for sale; paraffin, philosophical and scientific apparatus for schools, libraries and societies; professional books, implements and instruments, and tools of trade or occupation in the actual possession at the time of persons arriving in the United States.

AT the Leathersellers' Hall on Wednesday, May 12, a large company assembled at a conversazione; the Master, Dr. W. H. Perkin, F.R.S., and Wardens receiving the guests. The numerous and varied nature of the exhibits added great interest to the occasion; and not only were scientific discoveries, mostly of recent date, shown, but the industry associated with the name of the Company was well illustrated. Several very interesting objects were also sent from the different branches of the City and Guilds Institute, a creation of the City Companies of which they may well be proud. The following is a brief summary of the exhibits:—Specimens illustrative of the manufacture of coal-tar colouring matters, and their application, Dr. W. H. Perkin. Among Prof. Ayrton's exhibits may be mentioned an ingenious water model illustrating the retardation of signals in a submarine telegraph cable, a mechanical model illustrating the principle of duplex telegraphy, and some instruments employing the magnifying spring devised by Profs. Ayrton and Perry. Prof. Roberts-Austen exhibited an electric furnace in operation, throwing an image of the interior on a screen. A most interesting collection of specimens of artistic bookbindings was exhibited by Mr. H. B. Wheatley. Photography in colours, and various processes of photographic reproduction were largely represented. Sir H. T. Wood exhibited illustrations of the Dansac-Chassagne process of colour photography. The Autotype Company showed various pictures reproduced by their process, and Mr. Ives gave lantern demonstrations of the Kromskop. Other exhibits included specimens from the Leathersellers' tanning and dyeing school; maps, diagrams, &c., made by the boys in Colfe's school, which is under the management of the Company; specimens in illustration of research work now in progress in the chemical department of the Central Technical College, and several others too numerous to mention in this brief summary.

TWO young oak-trees were planted on May 11, at Cowthorpe, near Wetherby, to commemorate the celebrated tree which stands there still, but is greatly decayed, and may not endure much longer. The old tree, as every one knows, girths more than fifty feet, and is in that respect probably the largest oak in the world. The young oaks have been raised from acorns taken from the old tree by Mr. John Clayton, of Bradford, in 1893. The late Mr. Montagu, of Ingmanthorpe, approved of this method of perpetuating the memory of the wonderful tree.

PROF. JOHN MILNE, F.R.S., has sent us a list of ninety-three earthquakes observed by him at Shide, Isle of Wight, from June 14, 1896, to March 1897. The Greenwich mean time of each disturbance is given, and the character and intensity of each record is stated.

IN the *Annales de la Société Belge de Microscopie*, M. A. Lemeere records the results of an experiment in establishing a "peripatetic laboratory" for the zoological and botanical students of the University of Brussels during the summer vacation.

WE learn from the *American Naturalist* that President Cleveland had, by proclamation, set apart thirteen new forest reserves in the United States, representing an area of more than 21 million acres. This increases the total reserve forest land in the West to 39 million acres. The new reserves include all the central portion of the Black Hills of South Dakota, the Big Horn Mountain Range in Wyoming, the Jackson Lake country south of the National Park in Wyoming, all the Rocky Mountains of Northern Montana, a valuable forest region in Northern

Idaho, the principal part of the Bitter Rest Mountain region in Montana and Idaho, the Cascade Mountains of the Yosemite National Park, the San Jacinto Mountains in Southern California, and the Uintah Mountains in Northern Utah. The selection of these forest lands was made by the Commission appointed by the National Academy of Sciences. Strong opposition has been made to the appropriation by private owners.

"THE FLORENTINE CRICKETS " is the title of an interesting essay in the folk-lore of these insects, by Sophia Beale, in *The Reliquary and Illustrated Archæologist* (vol. iii., 1897, p. 65). In Florence, at the Festival of the Ascension, "all the inhabitants prance about carrying little cages dangling from their fingers. It is an ancient custom, its origin is as vague as the date of its institution, but all agree that the little beasts, which are imprisoned in the cages, are a species of talisman—an omen for good or evil to the person who possesses them."

THE re arrangement of the Free Public Museums of Liverpool is rapidly progressing under the administration of Dr. H O. Forbes. He recognises that Anthropology, or rather that portion of it which is now sometimes termed Anthropography, is a branch of Biology, and so he has devoted a gallery to an exposition of the main races of men at the end of the series of galleries allocated to the Vertebrates. The collection forms an instructive introduction to Ethnology, and we hope that he will be able to make it more complete as opportunities present themselves. The Ethnographical collections, which are in another part of the building, are well displayed, and contain many interesting objects. These collections, together with the well-known Archæological treasures in the Museums, afford a good foundation for Anthropological studies in Liverpool.

THE *Records* of the Geological Survey of India (vol. xxx. part 1) contain the full account of a palæo-botanical discovery which has been made independently and simultaneously in India and in South Africa. The fossil plant-structure long known under the name of *Vertebraria* is now shown to be nothing else than the rhizome of the fern *Glossopteris*, which has given its name to the remarkable flora of the Gondwana-beds of the southern hemisphere. The specimens figured by Mr. R. D. Oldham show the association of leaf and rhizome clearly, as also do those described by M. Zeiller from near Johannesburg.

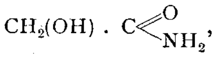
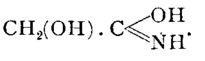
M. ÉMILE MÜLLER, Professor in the Lycée of Tashkent, sends to the Société de Géographie an extract from an account of an expedition on the Pamirs by Messrs. Olifsen and Filipsen, Danish officers, describing a remarkable tribe of dwarfs discovered in a little-known part of this region. The men of this tribe are invariably of exceedingly small stature, and a similar dwarfish habit extends to the domestic animals; the oxen of this district are about the size of donkeys, donkeys are no bigger than dogs, while goats and sheep are mere miniatures. In the original account published in the Russian journal, *Pravitelstvenni Viestnik*, for January 11/23, the explorers ascribed these anomalies to the exceptional environment and the arrested development due to the great scarcity of food. The tribe in question is entirely savage, badly armed, and wholly occupied in hunting; their religion is a species of fire-worship.

AMONG recent papers dealing with optical theories in general, we would call attention to Herr Paul Glan's interesting series of theoretical investigations on elastic bodies and light, in *Wiedemann's Annalen*, where results are found agreeing remarkably well with those obtained by experiment with Röntgen and ultra-violet rays; to a short paper in the *Berliner Sitzungsberichte*, by Prof. H. Rubens and E. F. Nichols, on the observation of electric resonance in heat rays of great wave-length; to a lengthy memoir, by Prof. G. Quesneville, on the double elliptic refraction of quartz (Paris, Offices of the *Moniteur Scientifique*, 1896), in which the author criticises MacCullagh's theory; and to Prof. Augusto Righi's two papers in the *Atti dei Lincei*, vi. 6—one on the elliptic polarisation of electromagnetic waves and their ellipsoid of polarisation in selenite, the other dealing with the absorption of electro-magnetic waves.

PROF. G. O. SARS, who has for many years been specially engaged in the study of the various groups of Crustacea, has in preparation a complete account of the Crustacea of Norway, and his work is now in course of publication by the Bergen Museum. All the known Norwegian species will be described, and will be accompanied by carefully drawn figures of all the forms. Parts iii. and iv. of vol. i., containing descriptions and illustrations of members of five families of Isopods, viz. Anthuridæ, Gnathiidæ, Ægidæ, Cirolanidæ, and Limnoriidæ, have just been issued.

SOMEWHAT late in the season we have received from Mr. Murray a new edition of his "Handbook for Travellers in Lower and Upper Egypt," which has been practically re-written and edited by Miss Brodrick, Prof. Sayce, and Captain Lyons, R.E. It has long been known that the late Sir G. Wilkinson's "Guide" was antiquated, and many of his views and conclusions have for some time past been shown to be untrustworthy, notwithstanding their excellence forty or fifty years ago. Mr. Murray's new work is well printed on thin paper, and takes up less room than the earlier editions; we venture to think that a "Guide" in one volume is always more useful than one in two. We welcome the new maps with which the book is furnished, and every one who takes any interest in hieroglyphics will rejoice that the old wood-blocks of the cartouches of the kings' prænomens and nomens have been replaced by legible hieroglyphic type. A special feature of the book is the Arabic Vocabulary; and although it is hard to understand on what principle the words have been selected, it will, no doubt, be useful to the intelligent visitor to Egypt.

MESSRS. GEORGE HOUGHTON & SON, photographic manufacturers and dealers, have just published a comprehensive illustrated catalogue of photographic apparatus and materials.

MANY chemists have at various times expressed the view that the acid amides, such as acetamide and benzamide, have not the constitution which is usually assigned to them, $NH_2 . R = O$, but are in reality hydroxy-derivatives of the formula $NH = R . OH$. An important contribution to this subject is made in the current number of the *Berichte* by W. Eschweiler, who has succeeded in preparing a new isomeride of glycollamide,  $CH_2(OH) . C\begin{smallmatrix}\nearrow O \\ \searrow NH_2\end{smallmatrix}$, which differs entirely in properties from that compound, and appears to be the hydroxy-compound  $CH_2(OH) . C\begin{smallmatrix}\nearrow OH \\ \searrow NH\end{smallmatrix}$. The new compound is obtained by heating the corresponding nitrile, $CH_2(OH) . CN$, with water to a high temperature, and, like glycollamide, is converted into glycollic acid by the action of alkalis. The author has obtained similar isomerides of a number of other acid amides, the full description of which will be awaited with interest.

THE current number of the *Zeitschrift für Physikalische Chemie* contains a paper, by Prof. Ostwald, on the crystallisation of super-saturated solutions and of super-cooled liquids, which adds considerably to our knowledge of this little-studied subject. The chief difficulty of the experiments is caused by accidental infection of the solutions by particles of solid dust. This may be avoided by a proper choice of substances, and it may then be proved that crystallisation is only caused by the introduction of a crystal of the substance, or of a strictly isomorphous substance. For example, fused salol (melting point 39°·5) cannot, at ordinary temperatures, be induced to crystallise by any of the usual means; but if a fine thread of glass be lightly drawn over a crystal of salol, it acquires the power of inducing crystallisation in the liquid; it loses it again by exposure to the air for a few minutes, by wiping with soft sheet india rubber, or by warming above 40°. There is, however, only a limited range of temperature below the melting point in which spontaneous generation of crystals is impossible; the liquid is here in stable equilibrium, except with respect to a ready-formed crystal. Ostwald proposes the name *metastable* for this condition. At still lower temperatures, crystals form spontaneously and without the presence of ready-formed nuclei; the equilibrium is here really labile. The analogy between the phenomena observed during the passage from the liquid to the solid condition, and those observed in the passage from gas to liquid, is pointed out. Notwithstanding the very minute quantity of substance required to start the crystallisation, Prof. Ostwald has succeeded in showing that it has a lower limit. The two methods employed (successive dilution with an indifferent solid substance in the way practised by the homœopathists, or evaporation of minute drops of successively more and more dilute solutions of the solid on a platinum wire, and introduction of the residues into the supersaturated liquid) gave practically identical results. With sodium chlorate solution, for example, containing 107 parts of the salt to 100 of water, the smallest quantity of solid, which would still induce crystallisation, was from a millionth to a ten-millionth of a milligram. The fact that a very minute quantity of ammonia alum induces crystallisation of a solution of potassium alum, instead of being itself dissolved, may be explained by supposing that the dissolved salt diffuses into the solid particle as soon as it comes in contact with the solution; a nucleus of the solid potassium alum having been thus formed, it continues to increase. This explanation is in agreement with the facts that only truly isomorphous salts are capable of forming solid solutions, and also that they alone are capable of mutually inducing crystallisation. For the statement and discussion of a proposition, which may be paraphrased as follows, the paper must be consulted. When a system passes from any given condition to a more stable one, it will not pass into the state which, under the circumstances, is the most stable, but into that which is nearest to the original state.

THE additions to the Zoological Society's Gardens during the past week include a White-throated Capuchin (*Cebus hypoleucus*) from Central America, presented by Sir Henry A. Blake, K.C.M.G.; a Pig-tailed Monkey (*Macacus nemestrinus*) from India, presented by Mr. W. B. Orme; an Egyptian Jerboa (*Dipus ægyptius*) from Egypt, presented by Mr. S. Whitehouse; a Kinkajou (*Cercoleptes caudivolvulus*), a Sharp-nosed Crocodile (*Crocodilus acutus*) from Venezuela, a Rough-eyed Cayman (*Caiman sclerops*), two Tuberculated Iguanas (*Iguana tuberculata*), a Black-pointed Teguexin (*Tupinambis nigropunctatus*), a Chequered Elaps (*Elaps lemniscotus*), an Anaconda (*Eunectes murinus*) from Trinidad, two —— Geckos (*Thecadactylus rapicauda*), a Cuvier's Scolecosaurus (*Scolecosaurus cuvieri*), an Agile Lizard (*Mabuina agilis*), three Thick-necked Tree Boas (*Epicrates ceuchris*), four Common Boas (*Boa constrictor*), five Cooke's Tree Boas (*Corallus cookii*), a Mocassin Snake (*Tropidonotus fasciatus*), a Boddaert's Snake (*Drymobius boddaerti*), a —— Snake (*Coronella calligaster*), a —— Snake (*Helicops angulatus*) from the West Indies, presented by Mr. R. R. Mole; an Anaconda (*Eunectes murinus*) from Trinidad, presented by Mr. F. W. Urich; an Indian Pigmy Goose (*Nettopus coromandelianus*) from India, a Laughing Kingfisher (*Dacelo gigantea*) from Australia, a Temminck's Snapper (*Macroclemmys temmincki*) from the Southern United States, deposited; six Mexican Quails (*Callipepla squamata*) from Mexico, purchased; two Egyptian Weasels (*Mustela subpalmata*), eight Shaw's Gerbilles (*Gerbillus shawi*), an Egyptian Jerboa (*Dipus ægyptius*), three Long-eared Hedgehogs (*Erinaceus auritus*), a Grey Monitor (*Varanus griseus*), nine Egyptian Cobras (*Naia haje*), eight Cerastes Vipers (*Cerastes cornutus*), a Rough-keeled Snake (*Dasypeltis scabra*), three Clifford's Snakes (*Zamenis diadema*), two Hissing Sand Snakes (*Psammophis sibilans*), ten Ocellated Sand Skinks (*Seps ocellatus*), four Vinaceous Turtle Doves (*Turtur vinaceus*), two Lesser Pin-tailed Sand Grouse (*Pterocles exustus*) from Egypt, received in exchange.

OUR ASTRONOMICAL COLUMN.

RESOLVING POWER OF TELESCOPES AND SPECTROSCOPES.—In the current number of the *Memorie della Società Degli Spettroscopisti Italiani* (vol. xxvi., 1897), Prof. F. L. C. Wadsworth discusses the question of the theoretical resolving power of optical instruments, distinguishing between four different cases. According to Rayleigh, the theoretical angular resolving power of any instrument having an aperture of width b is

$$\alpha = m\frac{\lambda}{b}$$

where α is the angle between two fine lines or points which can just be separated (a close double, for instance): λ the mean wave-length of the light employed, b the linear aperture of the instrument, and m a constant, varying according as the aperture is rectangular or circular. The spectral resolution of separation of a spectroscope can be determined from this formula by considering the dispersing train of prisms or gratings as a series of spectral images of the slit of the spectroscope. The four cases which are minutely dealt with are: (1) The resolving power (theoretical) of a spectroscope train for an infinitely narrow slit and monochromatic radiations, *i.e.* infinitely narrow spectral lines. (2) The resolving power (also theoretical) for a wide slit and monochromatic radiations. (3) The resolving power (limiting) for an infinitely narrow slit, but for lines of finite width $\Delta\lambda$. (4) The resolving power (practical) for a wide slit and non-monochromatic radiations, ranging for each line over a small value of $\Delta\lambda$, as in (3). This quantity represents the practical resolving power or purity of the spectrum.

The expression for the spectroscopic resolution for the second case differs from that obtained in the first by the presence of a new factor in the denominator of the former. The existence of this necessitates, as Prof. Wadsworth says, a considerable modification of certain statements based on the old formula of purity. Instead of a continual decrease with increase of slit width, the purity of the spectrum actually increases up to a certain point, and is equal to the theoretical resolving power of the instrument. On a further widening of the slit, the purity begins to diminish, but not so rapidly as previously supposed. This modification of the old idea requires, as he points out, a correction in Schuster's remarks on the practical purity of a bright-line spectrum, which gives the purity as 50 per cent. of the resolving power, and not 75 per cent., as Prof. Wadsworth now finds it must be. Other points of equal interest result from this new discussion, and are dealt with in this paper.

PHOTOGRAPHS OF METALLIC SPECTRA.—An investigation of considerable utility in astrophysics (*Sitzungsberichte der König, Preuss, Akad. d Wiss. zu Berlin*, March 4, 1897) has recently been concluded by Dr. O. Lohse in Potsdam. This consists in the determination of the wave-lengths of the lines in the spectra of cerium, lanthanum, didymium, thorium, yttrium, zirkonium, vanadium, and uranium, for the violet region 400 $\mu\mu$ to 460 $\mu\mu$. The spectra were obtained by photography with a spectroscope fitted with a prism filled with zimmtaethyl, the length of the resulting spectrum between the above wave-lengths measuring 180 mm. Spark spectra alone were investigated, and by means of a gas motor and dynamo a considerable strength of current was obtained. During the experiments it was found that the heat affected to an appreciable extent the refractive and dispersive power of the fluid in the prism, although it was not sufficient to be measurable with delicate thermometric instruments. The definition of the lines was therefore to